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First steps – the nascent green bond ecosystem in Hungary

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Abstract

This study aims to provide a complex overview of the sustainability aspect of green mortgage and corporate bonds issued in the Hungarian market. The assessment is based on the green bond frameworks, the business profile of each issuer, and the publicly available data of the issuances. The study analyses the seven sectors of the green bond market (real estate, construction, mortgage banks, holding companies, manufacturing, agriculture, wholesale and retail trade). It is proven that out of the sustainable development goals (SDG), SDG 7 is the most supported one. Most issuers plan to use metrics related to pollution prevention, energy efficiency, clean transportation, and water- and wastewater management. Moreover, in four of the seven sectors involved, corporate awareness of green issues could be considered high.

Keywords

Climate finance, Corporate governance, Green bonds, Sustainable finance

1. Introduction

Green bonds have become pivotal elements in financial markets in the past couple of years. Generally, the term *green bond* is used for debt instruments issued to raise funding for projects with environmental sustainability aspects. Therefore, they can offer investors an opportunity to deal with climate and environmental risks (Clapp et al., 2016). Apart from green bonds, several other financial instruments incorporate various environmental, social, and governance (ESG) goals or are linked to sustainability-linked measures. Nonetheless, this study focuses solely on green bonds, intending to shed light on the nascent Hungarian market.

Hungarian corporate and mortgage bond markets have been developing intensively in the past four years. This dynamic evolution has been catalyzed by the active involvement of the central bank of Hungary (Magyar Nemzeti Bank, MNB). The MNB launched the Bond Funding for Growth Scheme (BGS) in 2019 due to a strategic decision to develop the capital market to increase the liquidity of the corporate bond market. The central bank program also helped the creation and development of the Hungarian sustainable debt capital market. According to the decision of the Monetary Council, the program was ended in December 2021. Concerning mortgage bonds, the central bank has launched three programs since 2018 to spur the development of the domestic market. Most recently, the MNB introduced the Green Mortgage Bond Purchase Programme in August 2021. The strategic goal is to contribute to the development of the domestic green mortgage bond market by targeted purchases and, through this, encourage green mortgage loan activities.

The development of the sustainable debt market provides opportunity for companies to avoid a high cost of debt. As Chava (2011) concluded, companies with climate change concerns have a higher cost of equity and debt than firms with lower environmental risk exposure. Consequently, issuing green bonds can demonstrate that the issuers intend to manage climate-related risks. The companies' measures against climate-change-related physical and transition risks are also crucial from monetary policy aspects, since these risks will likely affect monetary transmission channels and influence price changes, as the Network for Greening the Financial System (NGFS) March 2021 Technical document (NGFS 2021) highlights.

Environmental sustainability is one of the key challenges of the 21st century, which is relevant in all aspect of our life, including finances and financial markets. However, there is no single definition of *green bonds* in the financial industry[1]. It is not evident what sustainability means in different cases, which sectors are concerned primarily, how the specific objectives are defined and met. These aspects are important, because they determine the "essence" of the green projects and also frame the cognition of sustainability in the given context.

To date, there has been no study published that would reveal the detailed characteristics or the sectoral specialities of the Hungarian green bond market. In order to fill this gap, the objective of our research was the mapping of the Hungarian green bond ecosystem, including green corporate and mortgage bonds. This paper is structured as follows. Section 2 describes the research questions, the methodology, and the data used, Section 3 presents the results, and finally, Section 4 is the conclusion.

2. Research questions, data and methodology

This study seeks answers to the following research questions:

1. What are the general characteristics of the Hungarian green corporate and mortgage bond markets in European comparison?
2. Based on the bond frameworks and publicly available corporate data, how the nascent Hungarian green bond ecosystem can be described on a sectoral basis from the point of view of green corporate strategy and actions, followed objectives and goals, green indicators and corporate green awareness?

The green issuances of 22 issuers between August 2020 and February 2022 were analyzed. Concerning Question 1, market' size, market' structure, and the tenors used by the issuers were evaluated, based on a comparison of the Hungarian and the European publicly available aggregated data.

To answer Question 2, a sector-level classification was applied to give a comprehensive picture from an economy-wide perspective. This implies that corporate and mortgage bonds were treated as one asset class, as the aim was to identify the effects of green bonds from an economic point of view rather than a financial aspect. The primary sources of the analysis were the green bond frameworks and public data related to the issuers. Given the standardized form of most of the documents and the evolution of green market conventions, it is possible to create clusters on the available information. The present study applies graduate layers to explore all attributes of issuers' green financing activities. This approach shows similarities to Ehlers et al. (2021), who proposed core principles with gradual layering to design effective taxonomies.

(a) Corporate actions. To recognize the benefits of green bonds, Corporate actions initiated with the use of the bond proceeds were identified. The possibility of standardization varies over sectors. For example, in some cases, the real estate sector has particular conventions that define the greenness of assets or certain projects. On the other hand, other sectors have fewer standardized measures, and best practices are yet to become unified.

(b) Sustainable Development Goals. The Sustainable Development Goals defined by the United Nations (UN SDG) are 17 high-level objectives with general guidance for the actual course of action. References to these goals and targets

[1] Several organizations developed their standards. See: ICMA (2021), CBI (n.d.), CBI (2020), European Commission (n.d.). *EU taxonomy for sustainable activities*.

have also become an integral part of green bond standards; therefore, it is feasible to compare bond issuances and the level of ambitiousness.

(c) Action level indicators. Most of the green bond frameworks contain Action level indicators intended to be integral parts of the lasting impact reports. These indicators provide quantified data on the beneficial environmental impacts of green projects or investments.

(d) Corporate awareness. We evaluated the status of the green or sustainability consideration in the general governance. Corporate awareness is rated based on firm-wide sustainability strategy, action plans, dedicated departments, committees, or chief officers with green mandates.

3. Results

By February 2022, the total amount of green corporate bonds reached 536 billion HUF reserves, accounting for about 10 percent of the Hungarian market. This is well above the European average, where the share of green bonds is about 3.5 percent in the corporate bond market. The stock of Hungarian mortgage bonds exceeded 141 billion HUF or 8.7 percent of the local market. The market share of green mortgage bonds is around 1.2 percent in European countries. The difference of green shares in Hungary can be explained by the relatively matured stance of the mortgage bond market, whereas corporate bond issuances became a frequently used funding solution only in the past two years. In sum, these are the most dynamic market segments in terms of volume as well as the number of issuers.

The issuances of the 22 issuers were classified into seven sectors (Table 1).

Table 1: Sector classification

Real estate activities	Construction	Financial and insurance activities		Manufacturing	Agriculture	Wholesale and retail trade
		Mortgage Banks	Holding companies			
CPI	GTC	OTP Jelzálogbank	AutoWallis	Hell Energy	Baromfi-Coop	Stavmat
Skygreen		Takarék Jelzálogbank	LP Portfólió	Vajda-Papír		Vöröskő
Futureal		UniCredit Jelzálogbank	Crown	Deltaplast		
SunDell		Erste Jelzálogbank		Kométa		
Wingholding						
Kopaszi Gát						
Biggeorge						

(Source: own results)

In terms of the original tenor, corporate bonds have all been issued with a 10-year maturity, which is in line with the current practices in the non-green market. We find that this is below the European average of 14.4 years. 'The average initial maturity of green mortgage bonds is 9.1 years more than what we can identify for non-green issuances (7.2 years) and the European market (6.4 years). Comparing it with the peer groups, it seems that only Hungarian green mortgage bonds were issued with significantly longer maturities.

Bond issuers were assigned to economic sectors based on their activities to present a comprehensive picture of the green bond ecosystem. Issuers are grouped according to the Hungarian activity classification (TEÁOR'08) identical to the European NACE Rev.2 statistical classification standard.

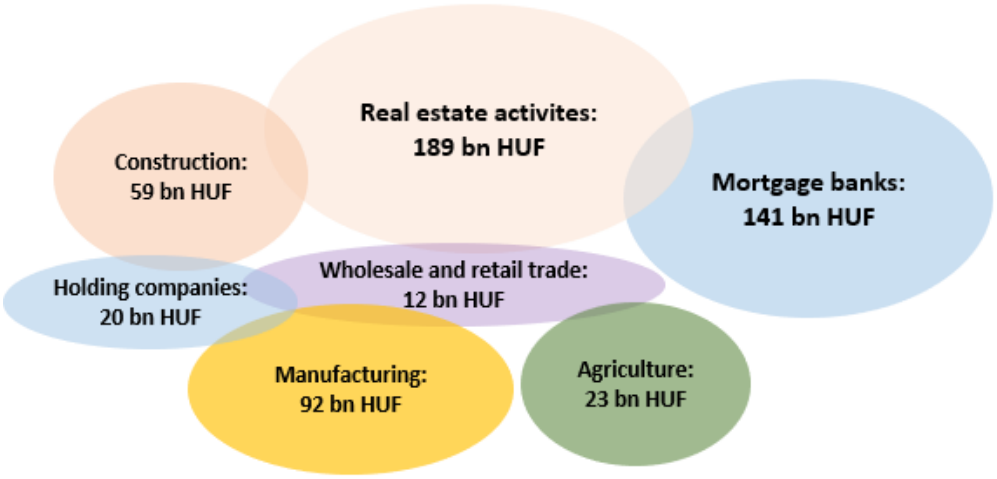

Figure 1. Sizes and connections of issuer groups

(Source: own results)

*Note: The actual sizes of the bubbles do not directly correspond to the size of the issuer groups.

Based on the nominal value of the bonds, we find that the most important sectors are real estate activities, construction, and finance *(Figure 1)*. Finance is split into two easily distinguishable subgroups: mortgage banks, and firms managing asset portfolios (holding companies). All these groups and subgroups are directly or indirectly linked to the real estate market. Another significant sector is manufacturing which, accounts for around 17 percent of the Hungarian green bond market. Agriculture is represented by one issuer, followed by two companies involved in wholesale and retail trade. Placing this into a European context *(Figure 2)*, we find that the structure of the EU green bond market is somewhat different: that market is dominated by the financial sector (38 percent), the electricity, gas, steam and air conditioning supply companies (30 percent), and the real estate developers (15 percent). Utility companies are missing from the Hungarian green bond portfolio, a sector that can play an essential role in the decarbonization efforts. According to the ECB's economy-wide climate stress test (Alogoskoufis et al. 2021), the electricity and gas sector is the second most exposed to transition risk; therefore, it could face a sharp fall in profits and higher production costs.

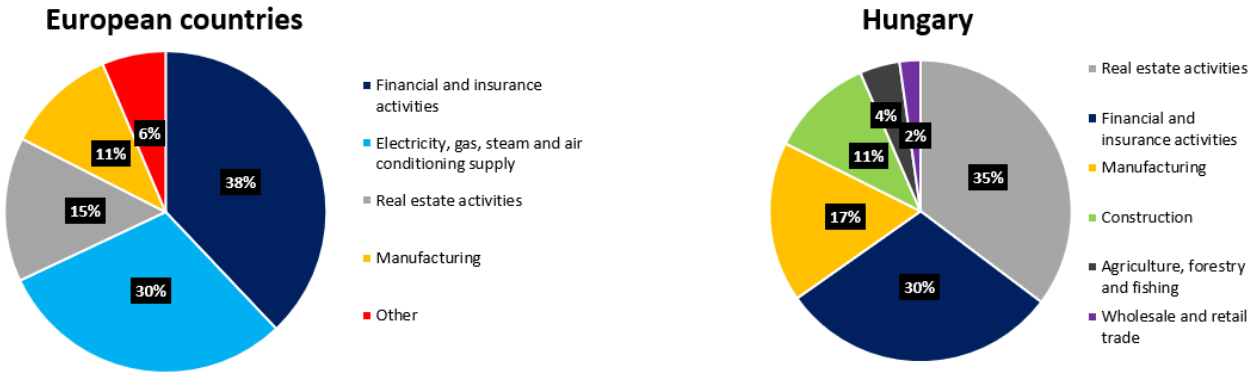

Figure 2. European and Hungarian green bond issuers by sector

(Source: Bloomberg)

*Note: Bloomberg's GICS industry classification GICS are converted to NACE codes applicable within the EU and Hungary based on our assessment.

The significance of real estate developers can be derived from the fact that buildings are responsible for around 40 percent of the EU's energy consumption and 36 percent of its GHG emissions, primarily because of construction, demolition, renovation, and usage. In addition, the European Commission estimates that about 2.5-3 percent of the building stock should be renovated and modernized every year to achieve the net-zero goals of the EU by 2050, although this rate is only around 1-1.5 percent currently. Moreover, the Climate Action Network Europe states that deep energy renovations can have environmental (energy savings, lower GHG emissions, improved air quality), economic (additional 160 thousand new green jobs), and social (7 million people can be lifted out of energy poverty) benefits (Climate Action Network Europe, 2021).

In the sectoral analysis, the four layers presented in Section 2 are applied to the defined sectors: (a) corporate actions, (b) Sustainable Development Goals incorporated in the framework, (c) action level indicators, (d) corporate awareness. The results are summarized in *Table 2*.

Table 2: Summary of assessment

	Real estate activities	Construction	Financial and insurance activities		Manufacturing	Agriculture	Wholesale and retail trade
			Mortgage banks	Holding companies			
Number of issuers Issued amount	7 189 bn HUF	1 59 bn HUF	4 141 bn HUF	3 20 bn HUF	4 92 bn HUF	1 23 bn HUF	2 12 bn HUF
Corporate actions	- Acquisition and construction of commercial and residential real estate assets - Installation of the renewable energy sources - Renovation of existing properties - Expanding e- mobility services	- Acquisition, development and management of commercial and residential real estate assets - Installation of the renewable energy sources	- Refinancing of residential mortgage loans with high energy efficiency collaterals (Purchases of new or used homes, refurbishment and renovation of existing homes with energy saving targets)	- Acquisition of green buildings - Renovation of buildings with energy efficiency goals - Production and/or Installation of renewable energy - Development of e-mobility services	- Expansion of the production units' capacity to produce less energy- intensive goods - Increasing the share of renewable energy - Reducing waste and water use	- Capacity expansion (feed factory, mixing line, by- product facility) which also results in energy-efficiency improvement - Modern biological treatment of 25- 30% of wastewater - Automation of processes	- Acquisition and construction of green buildings (factory and warehouse) - Retrofitting of existing premises to increase energy efficiency - Automation of processes - Modernization of technologies
Top UN Sustainable Development Goals	7, 9	11, 12	7, 9	7, 11	6, 12	6, 7	7, 12
Impact indicators	- Site energy savings (MW/year) - CO_2 emission avoidance (tCO_2/year) - Spared water usage (m^3/year)	- CO_2 emission avoidance (tCO_2/year) - Energy efficiency gain relative to baseline (%) - Spared water usage (m^3/year)	- Site energy savings (MW/year) - CO_2 emission avoidance (tCO_2/year)	- Renewable energy generation (MW/year) - CO_2 emission avoidance (tCO_2/year) - Share of renewable energy sources (%)	- Energy saving on units product - GHG reduction per unit of product - Spared water usage (m^3/year)	- Energy consumption saved (kWh/year) - CO_2e/year avoided - Spared water usage (m^3/year)	- Energy consumption saved (kWh/year) - CO_2e/year avoided - Spared water usage (m^3/year)
Corporate awareness	Average	High	High	Low	High	Average	High

(Source: own results)

The details concerning the different sectors, based on the layers (a)–(d) are presented below.

3.1. Real estate activities and construction2

(a) Companies active in the Hungarian real estate markets are the most significant actors both in numbers and issued volume (eight issuers, 249 bn HUF allocated amount). The seven real estate companies typically buy, sell, and develop real estate assets and provide various services with the holdings. With a very similar profile, one construction company has a primary focus on building operations and developments. Issuers are primarily engaged in commercial real estate business; however, the construction and development of residential properties are also included in their activity. In the case of commercial real estate, the sustainability aspects are measured by Energy Performance

[2] Since the business scope of the real estate and construction companies are identical, and we find further similarities in the features of the green bond issuances, this section handles them within one category.

Certificates or EPC (European Commission, 2021) or by the BREEAM, LEED or DGNB standards. LEED is the most widespread benchmark among the Hungarian real estate developers investing in green buildings with eight green bond issuers. Regarding other certificates, seven issuers refer to EPC and BREEAM as eligible schemes for their green buildings, while three also list the DGNB standard.

Table 3: Minimum entry criteria for commercial and residential real estates as of 2022

	LEED	EPC	BREEAM	DGNB
Category	Gold	10% better than minimum EPC BB	Excellent	Gold
Description	60-70 points out of 110 points	10% better than minimum NZEB[3]	Top 10% of buildings (best practice)	Minimum 50% performance index

(Source: LEED, European Commission, BREEAM, DGNB)

(b) When we look at UN SDGs, it is clear that the real estate and construction sector can contribute to the climate goals in direct ways. Most commonly – as part of the *UN SDG 7 Affordable and clean energy* – companies aim to double the rate of improvement in energy efficiency and substantially increase the share of renewable energy in the energy mix. In practice, this can be achieved by constructing or developing buildings that meet green criteria or by implementing investments that lead to improvements in energy efficiency. These measures can also reduce the adverse per capita environmental impact of cities, by paying special attention to air quality and waste management, as per *UN SDG 11 Sustainable cities and communities.*

The frameworks adopted by the issuers are especially useful to demonstrate the sustainability of commercial buildings like offices and retail space.[4] Furthermore, some issuers use the proceeds of bonds to finance clean transportation solutions as they intend to increase e-mobility capacities by installing charging stations and expanding e-car sharing capabilities. Through these investments, companies can also contribute to the above-mentioned UN SDGs, in particular to *SDG 11 Sustainable Cities and Communities* by providing access to safe, affordable, accessible and sustainable transport systems for all.

(c) Real estate developers and construction companies typically use impact indicators related to energy efficiency and the reduction of greenhouse gas (GHG) emissions, like energy efficiency in Primary Energy Demand ($kWh/m^2/year$), site energy savings (MW/year), spared water usage ($m^3/year$), and avoided CO_2 emissions ($tCO_2/year$).

(d) Corporate awareness is above average among these companies. Typically, they have embraced ESG or sustainability strategies and some of them assigned relevant accountabilities to management functions. The reason behind this advance is that real estate development and construction activities are highly standardized with quantitative indicators, so this foundation provides a firm basis for companies to define and present their alignment with the related standards.

[3] In the European Union (EU), the concept of Nearly zero-energy emission building (NZEB) is often used by issuers, as it provides a clear definition of eligible projects and assets. The EPBD defines the NZEB concept, and EU member states have to adopt it in their national legal system. See: Commission Recommendation (EU) 2016/1318 http://data.europa.eu/eli/reco/2016/1318/oj, Directive 2010/31/EU http://data.europa.eu/eli/dir/2010/31/2018-12-24 and EU Taxonomy Compass https://ec.europa.eu/sustainable-finance-taxonomy/tool/index_en.htm

[4] Renovation is also an integral part of this segment, and it can effectively contribute to the greening of the existing Hungarian buildings stock. Under this category, the eligible projects should result at least a 30 percent reduction in Primary Energy Demand, or the building renovation should comply with the applicable requirements for *significant renovations.* See: Directive 2010/31/EU http://data.europa.eu/eli/dir/2010/31/2018-12-24

3.2. Mortgage banks

(a) The first green mortgage bond was issued in August 2021. Since then, three other mortgage banks stepped into the green market, therefore, this asset class can be considered as one of the most topical financing solutions (four issuers, 141 bn HUF issued amount). The applied green definition varies among mortgages banks. One of the bond series has been issued with CBI compliance,[5] but it also contains a reference to the EU Taxonomy. Three bonds are ICMA-compliant with a diverse set of rules. On one side, some mortgage banks require properties to fall within the best 15 percent based on Primary Energy Demand and do not consider the tenor of the related bond. There is also an example for a stricter approach where issuers demand compliance with NZEB or EU Taxonomy (NZEB - 10 percent), depending on the year of construction. Funds from green mortgage bonds can also refinance loans for renovation purposes. From this point of view, we can observe a uniform method among issuers. Renovation of existing buildings should result in a 30 percent improvement in the Primary Energy Demand, which is in line with the CBI methodology and commercial building practices. There are also alternative criteria applied by mortgage banks that use EU Taxonomy regulation (Regulation (EU) 2020/852), the Preferential Green Capital Requirement Treatment of MNB (Preferential capital requirements program for green corporate and municipal financing) or the Energy Performance of Buildings Directive as reference points.

(b) In terms of UN SDGs, the primary goals are similar to what we can identify at the real estate and construction sectors. With the refinancing of green buildings and renovations, mortgage banks can support *UN SDG 7 Affordable and clean energy* by increasing the share of renewable energy and therefore doubling the global rate of energy efficiency improvements. These activities can also help foster *SDG 11 Sustainable cities and communities* by reducing the environmental impact of cities.

(c) Mortgage banks intend to measure the beneficial impacts of green bond issuances by two main indicators. Annual site energy savings (in MW/year) can be calculated using the difference between the national building stock average and the refinanced portfolio. If there are no sufficient data available on all individual buildings in the portfolio, issuers might apply the best 15 percentage rule, leading to a rather conservative outcome. The other indicator is CO_2 emission avoidance (in tons of CO_2/year) which is determined by the multiplication of annual site energy savings and the corresponding carbon emission intensity. This represents a rough estimation of how much greenhouse gas emission has been avoided due to the fact that mortgage banks refinanced mortgage loans backed by green buildings instead of regular, "brown" ones.

(d) There is a relatively high corporate awareness towards sustainability considerations. All mortgage banks set up a dedicated committee to address responsibilities related to the green bond issuances. Moreover, virtually all issuers or their parent companies have a global, company-wide strategy to achieve sustainability-related targets, and in many instances, the corresponding responsibilities are assigned to dedicated management functions.

3.3. Holding companies

(a) Most green investments target the acquisition or construction of new commercial estates or renovation of existing ones. Another substantial part of bond issuances will be invested in the development of e-mobility services to increase the share of zero-emission vehicles and the number of electronic vehicle charging stations. In Hungary, the business activities of the three holding companies cover a broad range: as a mutual area, all of them are interested in real estate either by their operational background or as part of the investment portfolio (three issuers, 20 bn HUF issued amount).

(b) With the completion of the real estate investments and e-mobility expenditures, holding companies aim to contribute primarily to *UN SDGs 7 Affordable and clean energy* and *9 Industry, innovation and infrastructure*. In a strong connection with this – as part of *11 Sustainable cities and communities* goal – issuers are also committed to reducing cities' adverse per capita environmental impact, by paying special attention to air quality and municipal and other waste management.

(c) The impacts of corporate actions are measured by several metrics, while projects have typically well-defined focuses. For investments that aim to improve the energy efficiency of premises, companies intend to report the level of CO_2 emission avoidance and site energy savings, the capacity of renewable energy production (in MWh/year), and the ratio of green energy within the total consumption. Concerning e-mobility expenditures, on top of the energy-saving

[5] The CBI eligibility criteria for low carbon buildings are determined by the Primary Energy Demand and the tenor of the mortgage bond. For Primary Energy Demand, CBI sets a hurdle rate for every country that represents the best 15 percent of residential buildings from an energy efficiency perspective at a given time.

results, upcoming reports will contain information on the share of electronic cars in the fleet as well as on the number and geographic coverage of new charging stations. For the issuer involved in the vehicle trade business, there are minimum requirements stipulated by the foreign producer company as part of their business cooperation. This issuer published several specific goals that clearly state the expected outcomes. For example, they aim to reach a 30 percent share of renewable sources within the total energy mix, and they have specific commitments such as the efficient reuse of rainwater, the installation of eco-friendly cooling-heating solutions, or lighting systems. These commitments are also in line with the National Energy and Climate Plan. According to this Hungary will increase the share of renewable energy sources to at least 21 percent within gross final energy consumption by 2030 (MIT, 2018). Consequently, this requires significant efforts and sufficient financing since renewable energy sources account for only 13 percent (KSH, 2018).

(d) Sustainability awareness is low among holding companies. There is no data on a comprehensive strategy, dedicated management function, or another form of activity that would pursue environmental goals. At one issuer, we find evidence that the preparation of an ESG strategy is underway. Furthermore, due to the cooperation with a foreign car producer, the company must follow sustainability-related guidelines.

3.4. Manufacturing

(a) Manufacturing is the third most significant major sector in Hungary that issues green bonds, following real estate and construction companies, and financials. These companies invest in capacity expansion, which eventually leads to lower energy intensity, less waste generation and water use in production processes. At the same time, they would also increase the share of renewable energy in their energy mix (four issuers, 92 bn HUF issued amount).

(b) Based on the frameworks, it can be concluded that mainly two UN SDGs are affected positively by the commitments: 6 and 12. These green bond issuances support Clearwater and Sanitation as they can substantially increase water-use efficiency across the sector. More importantly, the goal of (*12) Responsible consumption and production* is also supported, since these investments will lead to less paper or primary aluminum consumption or more energy-efficient meat processing.

(c) Firms in this sector aim to reduce the carbon intensity of their products and lower water and energy use or change the raw material for production. In the case of the energy drink producer, the use of at least 75 percent secondary (recycled) aluminum for can production made the ambition eligible for green bond issuance. Aluminum is infinitely recyclable, and primary aluminum is very carbon intensive, while PET recyclability is limited. This processing method is also in line with the technical screening criteria of the EU Taxonomy, and it is expected to be aligned with the upcoming EU green bond standard as well. The most common impact indicators measure energy saving on a product unit and the GHG reduction per product unit, which primarily reflects energy efficiency improvements. Metrics regarding water usage is also an essential element that issuers will regularly track.

(d) All but one of the issuers have a separate website that presents the company's sustainability efforts and achievements. In addition, most of them appointed a dedicated person responsible for sustainability issues. One of the companies has a comprehensive sustainability strategy with critical milestones, and green bond issuance is an integral part of their sustainability journey. Another issuer made significant investments to secure better wastewater management in the past years.

3.5. Agriculture

(a) According to Eurostat (2020), agriculture is responsible for about 10 percent of the EU's total GHG emissions, which shows that companies of this sector can play a significant role in the decarbonization of the European economies. In Hungary, the share of the agriculture sector's GHG emission in the total emission of the economy is around 7 percent. So far, there has been only one green bond issuance in the agricultural sector in Hungary (1 issuer, 23 bn HUF issued amount). The use of bond proceeds is similar to manufacturing companies: expanding capacity while making unit production more efficient and reducing pollution, waste and water use.

(b) The company can primarily contribute to *UN SDG 7 Affordable and clean energy* with the increase of the share of renewable energy in the global energy mix, and to *12 Responsible consumption and productions* by achieving sustainable management and efficient use of natural resources.

(c) Regarding impact indicators, the one issuer in this sector focuses on energy consumption, measured by avoided annual CO_2 emissions and spared water usage. This is largely in line with the indicators used by the Hungarian manufacturing companies.

(d) The level of corporate sustainability awareness is average, because although the company has a dedicated site related to corporate social responsibility and a person responsible for sustainability, a separate sustainability department and a comprehensive strategy are missing.

3.6. Wholesale and retail trade

(a) The two companies in wholesale and retail trade have a combined issuance volume of 12 billion HUF (2 issuers, 12 bn HUF issued amount). One of the companies operates primarily in trading construction materials, but it also produces building materials. The other issuer is a retail shop chain selling consumer electronics. Issuances aim to finance the acquisition or construction of new main sites and renovation of the existing facilities. As significant projects, companies start to build a new factory and a new central warehouse. A prominent characteristic of the sector is that these companies have an extensive geographical and physical presence with multiple premises in Hungary. To address related climate issues, green bond proceeds are eligible funding sources to renovate these buildings, including the modernization of lighting and heating, doors and window systems.

(b) Wholesale and retail trading companies intend to contribute to several UN SDGs. By the construction, acquisition, or retrofitting of facilities, they can double energy efficiency as per the earlier mentioned subgoal of *7 Affordable and clean energy*; moreover, the application of the latest innovations can help to increase the level of *12 Responsible consumption and production*. The renovation of premises will also improve work conditions contributing to *8 Decent work and economic growth.*

(c) Since most of the investments should result in a lower usage of electricity and natural resources, future assessments will use saved energy consumption (kWh/year) and avoid CO_2 emission (tons/year) as the key metrics. In the case of a new factory, the related issuer intends to apply additional metrics regarding water and waste reuse.

(d) Both issuers have embraced environmental and social awareness in their general corporate philosophy. Green considerations are represented on a high level in the decision-making process. Group-level strategy, dedicated management roles, and committees have been set up, and external experts are also involved in one case. One of the companies realized the environmental responsibility derived from the consumption of the traded goods. It collects electronic waste and out-of- use electrical household appliances from customers and hands them over to specialized companies dealing with recycling of the components.

4. Conclusion

In this paper, the Hungarian green bond market was analyzed. The evaluation is based on the green bond frameworks, each issuer's business profile, and the publicly available data. The main characteristics of the Hungarian green bond market can highlight the current state of the sustainable debt market in the country. In addition, the possible development areas and directions are also outlined based on the existing green bond issuances.

The Hungarian corporate and mortgage bond markets have been developing intensively in the last four years. By the first quarter of 2022, the total amount of green corporate bonds reached about 10 percent of the Hungarian market, and the stock of Hungarian mortgage bonds exceeded 8.7 percent of the local market. These shares are about 3.5 percent and 1.2 percent in the European countries, respectively.

From a sectoral perspective we find that that the most dominant sectors are real estate activities, construction, and finance. Comparing our results with the European markets we highlight, that while utilities and power generating companies make up almost 30 percent of the total European corporate green bond amount issued, these industries are still missing from the Hungarian green bond portfolio. For all cases, real estate and construction sectors have significant shares in green bond market that can be explained by the remarkable GHG emission intensity of buildings and the need of modernization of these real estates.

As the Green Bond Frameworks usually match their targets with the UN SDGs, these goals can suggest the most important commitment areas of the issuers. In our dataset, SDG 7 is the most supported goal, followed by SDGs 11, 9, and 12. This preference emphasized the prevalence of energy efficiency-related projects, while sustainable cities/communities and environmentally conscious industry solutions are also often considered in the frameworks. These investments have paramount importance in reaching specific climate goals.

Regarding the top impact indicators, most issuers plan to use metrics related to pollution prevention, energy efficiency, clean transportation, and water- and wastewater management to present their environmental performance in the form of impact reports.

Concerning corporate awareness, four of the seven sectors involved could be considered as scoring high, two sectors have “average“ scores, and there is only one sector where sustainability awareness deems low, essentially because of lack of data on a comprehensive strategy, dedicated management function or other forms of activity that would pursue environmental goals.

All things considered, we can conclude that green bond issuers started the transition to a net-zero economy as they invest in sustainable projects and assets, set relevant indicators, and create a comprehensive sustainability strategy to be competitive in a net-zero environment in the coming decades.

References

Alogoskoufis, S., Dunz N., Emambakhsh, T., Hennig, T., Kaijser, M., Kouratzoglou, C., Muñoz, M. A., Parisi, L., Salleo, C. (2021). ECB economy-wide climate stress test – Methodology and results. European Central Bank Occasional Paper 281. https://www.ecb.europa.eu/pub/pdf/scpops/ecb.op281~05a7735b1c.en.pdf?278f6135a442cd0105488513e77e3e6d Downloaded: 1 March 2022.

CBI. (n.d). *Explaining green bonds*. https://www.climatebonds.net/market/explaining-green-bonds Downloaded: 1 March 2022

CBI. (2020). *The Climate Bonds Certification Scheme*. Climate Bonds Initiative. https://www.climatebonds.net/files/files/CBI_Certification_Brochure_Nov2020.pdf Downloaded: 1 March 2022.

Chava, S. (2011). *Environmental Externalities and Cost of Capital*. SSRN. DOI: https://doi.org/hmcs

Clapp, Ch. – Alfsen, K. H. – Lund, H. F. – Pillay, K. (2016). *Green Bonds and Environmental Integrity: Insights from CICERO Second Opinions.* CICERO Policy Note 2016: 01. https://www.environmental-finance.com/assets/files/research/11-05-16-cicero.pdf Downloaded: 1 March 2022.

Climate Action Network Europe (2021): *The hidden costs of Europe's decrepit buildings* https://caneurope.org/decrepit-renovated-buildings-europe/ Downloaded: 2 March 2022.

Commission Recommendation (EU) 2016/1318 of 29 July 2016 on guidelines for the promotion of nearly zero-energy buildings and best practices to ensure that, by 2020, all new buildings are nearly zero-energy buildings. http://data.europa.eu/eli/reco/2016/1318/oj Downloaded: 25 March 2022.

Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (recast) http://data.europa.eu/eli/dir/2010/31/2018-12-24 Downloaded: 25 March 2022.

Ehlers, T. – Gao, D. – Packer, F. (2021). *A taxonomy of sustainable finance taxonomies* (8 October 2021). BIS Papers 118. https://www.bis.org/publ/bppdf/bispap118.pdf Downloaded: 1 March 2022.

European Commission. (n.d.). *EU Taxonomy Compass* https://ec.europa.eu/sustainable-finance-taxonomy/tool/index_en.htm Downloaded: 1 March 2022.

European Commission. (n.d.) *EU taxonomy for sustainable activities*. https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/eu-taxonomy-sustainable-activities_en Downloaded: 1 March 2022.

European Commission. (2021). *Questions and Answers on the revision of the Energy Performance of Buildings Directive*. https://ec.europa.eu/commission/presscorner/detail/en/QANDA_21_6686 Downloaded: 1 March 2022.

Eurostat. (2022). Archive: Agri-environmental indicator – greenhouse gas emissions. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Archive:Agri-environmental_indicator_-_greenhouse_gas_emissions&oldid=374989 Downloaded: 1 March 2022.

ICMA. (2021). *ICMA Green Bond Principles 2021*. ICMA, Paris. https://www.icmagroup.org/assets/documents/Sustainable-finance/2021-updates/Green-Bond-Principles-June-2021-140621.pdf Downloaded: 1 March 2022.

KSH. (2018). *Indicators of sustainable development for Hungary, 2018*. Hungarian Central Statistical Office, Budapest. https://www.ksh.hu/docs/eng/xftp/idoszaki/fenntartfejl/efenntartfejl18.pdf Downloaded: 1 March 2022.

Magyar Nemzeti Bank. (2021). *Zöld vállalati és önkormányzati tőkekövetelmény-kedvezmény* [Preferential capital requirements program for green corporate and municipal financing]. https://mnb.hu/letoltes/zold-vallalati-es-onkormanyzati-tokekovetelmeny-kedvezmeny.pdf Downloaded: 1 March 2022.

MIT. (2018). *National Energy and Climate Plan, Ministry of Innovation and Technology*. https://ec.europa.eu/energy/sites/ener/files/documents/hu_final_necp_main_en.pdf Downloaded: 1 March 2022.

NGFS – Network for Greening the Financial System. (2021). *Adapting central bank operations to a hotter world. Reviewing some options.* March 2021 Technical Document https://www.ngfs.net/en/adapting-central-bank-operations-hotter-world-reviewing-some-options Downloaded: 2 March 2022.

Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088, https://eur-lex.europa.eu/eli/reg/2020/852/oj Downloaded: 25 March 2022.

United Nations. (n.d.). *The 17 goals*. https://sdgs.un.org/goals Downloaded: 1 March 2022.